

## **REMARKS**

The Specification has been amended to correct various typographical errors.

New Claims 17-20 have been added. The new claims are supported, for example, by the disclosure in the Specification at page 8, lines 12-17, and page 6, line 7 through page 7, line 26. In particular, claim 17 is supported by the disclosure on page 8, lines 12-17, and on page 6, lines 13-25 of the Specification; claim 18 is supported by the disclosure on page 8, lines 12-17, and on page 7, lines 5-8 of the Specification; and claims 19 and 20 are supported by the disclosure on page 8, lines 12-17, and on page 7, lines 22-26 of the Specification.

### **Applicants' Arguments:**

Claims 1-16 were rejected under 35 U.S.C. §103(a) as obvious over Drent et al. (EP 0 577 206 A2) taken with Aida et al., J. Am. Chem. Soc.1983, 105, 1304-1309, in view of Shum et al. (USP 5,103,027) and Coates et al. (WO 03/050154). The basis of rejection is erroneous and respectfully traversed.

Drent et al. describes a catalyst system used in the carbonylation of epoxides. The European patent application of Drent et al. was cited by Applicants on page 1, lines 23-28 of the present Specification. The Drent catalyst system of the EP 0 577 206 A2 reference, comprised a source of cobalt and a hydroxy substituted pyridine compound. Drent et al. reported at page 2, lines 27-31 that the hydroxy substituted pyridines provided a much higher selectivity to the desired beta-propiolactone product than the previously used unsubstituted pyridines. There is no indication in Drent et al. that replacing the hydroxy substituted pyridines with any other material could beneficially change the catalyst system.

The Aida et al. reference was cited by Applicants on page 6, lines 30-32, of the present Specification. Aida et al. used such complexes to activate carbon dioxide (not carbon monoxide) in the reaction with epoxides to make the corresponding alkylene carbonate. See the sentence bridging pages 1304 and 1305 of the Aida et al. reference. Note that Aida et al. do not use any source of cobalt, ruthenium or rhodium in the process, and there is no suggestion that the

presence of any such metal would be beneficial. The process taught by Aida et al. is not a carbonylation reaction, i.e. it is not a reaction involving carbon monoxide.

The rejection of the claims was based on "Drent et al. taken with Aida et al." There is no basis for this combination of references. The Drent et al. reference did not cite or rely upon the Aida et al. reference for its disclosure, and so there is no reason that Drent et al. should be "taken with" Aida et al. Additionally, Applicants find nothing in either the Drent et al. reference or the Aida et al. reference that would teach or suggest to one of ordinary skill in the relevant art that the aluminum porphyrins in Aida et al., including compound (I d) produced by Scheme I, could be used in place of the hydroxy substituted pyridines in the catalyst system of Drent et al. in a carbonylation reaction involving carbon monoxide and epoxides. The technologies in the two references are different and they cannot be combined as a basis of rejection of the instant claims under 35 U.S.C. §103(a).

Further, Examiner referred to Scheme I in Aida et al. as showing an "analogous" process to that presently claimed. It is believed that Examiner may have misread the disclosure in Aida et al. According to the Aida et al reference, Scheme I shows a method of obtaining what Aida et al. described as a novel aluminum porphyrin (identified in Scheme I as compound (I d)) containing a long poly(oxyalkylene) chain bound to the aluminum atom. The so-called long poly(oxyalkylene) chain was produced from polymerizing the epoxide in the process. See page 1305, column 1, first full paragraph. The process set forth in Scheme I of Aida et al. cannot be qualified as an "analogous" process to the carbonylation process presently claimed.

Carbon dioxide chemistry and carbon monoxide chemistry are not analogous. Drent et al does not refer to carbon dioxide and the Aida et al reference does not refer to carbon monoxide, rather it is specifically concerned with carbon dioxide chemistry.

The secondary references (Shum et al. and Coates et al.) do not add anything that would render the claimed invention obvious.

Shum et al. disclose that oxorhenium porphyrin compounds are useful to catalyze the reaction of olefins with organic hydroperoxides to make epoxides. Shum et al. do not teach or suggest any metal-ligand coordination complex that contains cobalt, ruthenium or rhodium. The only porphyrin complexes in Shum et al. are oxorhenium compounds. Further, the reaction of

olefins with organic hydroperoxides are oxidation reactions. They do not involve carbon monoxide and they are not carbonylation reactions or analogous to carbonylation reactions. In Shum et al, epoxides are the end product, not the starting material. There is no reason to combine this reference with any of the other cited references.

Coates et al. disclose that various organic heterocyclics, including epoxides, can be reacted with carbon monoxide in the presence of certain catalysts. Examiner refers to pages 35 and 37, and to Claims 2 and 17, of the document in support of the rejection. The text relied upon by Examiner is believed to be the examples (and claims) describing the carbonylation of epoxides with carbon monoxide in the presence of certain catalysts.

In the relevant examples on pages 35 and 37, the catalysts used were identified as “catalyst G (0.2Mn DME)” and “catalyst E<sup>1</sup>.”

The catalyst used in the carbonylation reaction referred to on pages 34 and 35 is “catalyst G (0.2Mn DME).” It is not clear what this catalyst is. Catalyst (G) is represented by formula V wherein the metal ion, M<sup>+</sup>, is aluminum, but it is unclear what the parenthetical term (0.2Mn DME) means alone or as written in combination with “catalyst G.” The term “DME” is said to mean dimethoxyethane, a solvent (page 21, first full paragraph). For information regarding formula V, see the paragraph bridging pages 5 and 6, page 8, and on page 18, second full paragraph, and also on pages 26 and 27 under the heading of “Catalyst Synthesis Example 1, Synthesis of Catalyst (G).” The Coates et al. reference is therefore ambiguous and non-enabling with respect to this catalyst, and to any alleged carbonylation process involving this catalyst.

“Catalyst E<sup>1</sup>” is a species within the genus of compounds represented by formula VII wherein M is aluminum. See the information on page 10, first full paragraph, and page 19, second full paragraph, and page 29 under the heading of “Catalyst Synthesis Example 4, Synthesis of Catalyst (E<sup>1</sup>),” of the Coates et al. reference. Catalyst E<sup>1</sup> was allegedly used in the carbonylation reaction of oxetane on page 37 ((Example XXVI). Oxetane is a 4-membered cyclic alkylene oxide. See “Basic Principles of Organic Chemistry,” by Roberts and Caserio (1964) at page 970. (See enclosed copy) Oxetane is not an epoxide, according to Coates et al. See the disclosure on page 12, first full paragraph, of Coates et al. for their definition of epoxides. Thus, Example XXVI is not a carbonylation of an epoxide reaction, and Examiner has

not presented any reasoning as to why such a reaction would be the “same type” or “analogous” to the presently claimed process.

The catalysts in Coates et al., including the catalysts in the referenced examples, do not have ligands that are the same as or suggestive of the tetrapyrrole ligands of the metal coordination complexes used in the present invention. The catalysts are, therefore, different. The conclusion that Coates et al. teach “both catalyst components” as used in the presently claimed process is erroneous. Similarly, the conclusion that Coates et al. teach “both catalyst components” in the “same type” or an “analogous carbonylation” process is erroneous.

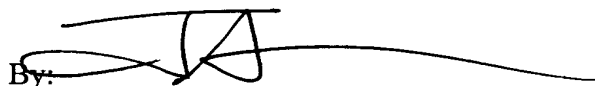
It is respectfully submitted that the rejection based on the combination of cited references is in error. Such references would not have been combined by one of ordinary skill in the art. The references would not have been combined because of the differences in the various catalysts and the differences in the processes in which they were used. Additionally, it is respectfully submitted that the Examiner did not consider all of the claim limitations, and, therefore, did not consider the claimed subject matter as a whole, as required by 35 USC §103(a). Finally, it is also respectfully submitted that Examiner did not establish a *prima facie* case of obviousness under 35 U.S.C. §103(a). Examiner’s analysis of patentability under the guidelines set forth by the Court in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966) fails because it did not include the several differences between the claimed subject matter and the cited references, as set forth above. In view of the above, Applicants respectfully request that the rejection be withdrawn.

**CONCLUSION:**

In view of the above amendments and remarks, Applicants believe the instant application to be in condition for allowance and respectfully request that such action be taken.

Respectfully submitted,

EIT DRENT ET AL

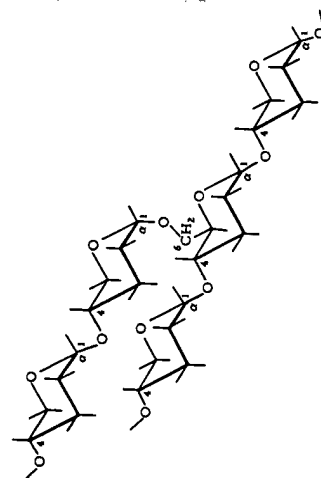
By: 

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Enclosure: "Basic Principles of Organic Chemistry," by Roberts and Caserio  
1964), page 970

# Basic Principles



BEST AVAILABLE COPY

# of Organic Chemistry

by **JOHN D. ROBERTS**  
*Professor of Organic Chemistry*

and **MARJORIE C. CASERIO**  
*Senior Research Fellow of Chemistry*

CALIFORNIA INSTITUTE OF TECHNOLOGY

W. A. BENJAMIN, INC.

1965 NEW YORK · AMSTERDAM

*Basic Principles of  
Organic Chemistry*

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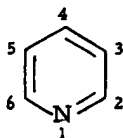
*The manuscript was put into production March 13, 1963, and  
this volume was published June 15, 1964; second printing,  
with corrections, March 5, 1965.*

*The publisher is pleased to acknowledge the assistance  
of Sophie Adler, who designed the book, and Russell F.  
Peterson, who drew many of the illustrations*

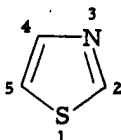
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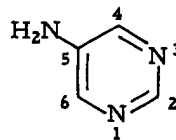
sulfur and sulfur over nitrogen for the number one position. This rule is illustrated in the following examples.



azine  
(pyridine)

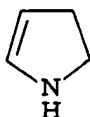


1, 3-thiazole



5-amino-1, 3-diazine  
(5-aminopyrimidine)

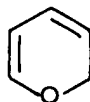
5. Partially reduced ring compounds are often referred to as dihydro or tetrahydro derivatives of the parent unsaturated compound. Saturation is also indicated by attaching the symbol H together with the number denoting position of saturation to the name of the parent unsaturated compound.



2, 3-dihydropyrrole  
(2, 3-dihydrazole)



2, 5-dihydrofuran  
(2, 5-dihydroxole)



2H-pyran  
(2H-oxine,  
α-pyran)



3H-pyrazole  
(3H-1, 2-diazole)

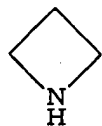
Applying these basic rules to specific examples is rather like putting together the pieces of a jigsaw puzzle. Some simple examples follow and, where the chosen example has a commonly used trivial name, both trivial and systematic names are given, the latter being in parentheses. It will be noticed that when two vowels come together, then "a" of the prefix is omitted. For example ethylene oxide is called oxirane by the IUPAC system, rather than oxairane.



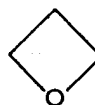
ethylenimine  
(aziridine)



ethylene oxide  
(oxirane)



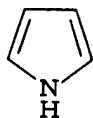
azetidine



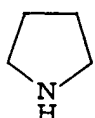
oxetane



thietane



pyrrole  
(azole)



pyrrolidine  
(azolidine)



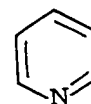
furan  
(oxole)



tetrahydrofuran  
(oxolane)



thiophene  
(thiole)



pyridine  
(azine)

#### EXERCISE 27-1

#### EXERCISE 27-2